

RESPONSE TO RESTRICTION REQUIREMENT

Serial Number: 10/716750

Filing Date: November 19, 2003

Title: STRUCTURE TO ACHIEVE HIGH-Q AND LOW INSERTION LOSS FILM BULK ACOUSTIC RESONATORS

Assignee: Intel Corporation

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IN THE CLAIMS

Claims 1-8. (Canceled)

Claims 9-27. (Canceled)

Claim 28. (Canceled)

29. (Original) A film bulk acoustic resonator device formed on a substrate having an opening therein, the film bulk acoustic resonator comprising:

a seed layer exposed about the periphery of the opening; and

a layer of piezoelectric material spanning the remaining portion of the opening.

30. (Original) The film bulk acoustic resonator device of claim 29 wherein the opening has a larger area near the layer of the piezoelectric material and a smaller area remote from the piezoelectric material.

31. (Original) The film bulk acoustic resonator device of claim 29 wherein the substrate further includes a major surface, the opening further including at least one sidewall, the angle between the at least one sidewall and the major surface of the substrate at an angle other than perpendicular.

32. (Original) The film bulk acoustic resonator device of claim 29 wherein the seed layer is in a first plane and the layer of piezoelectric material is in a second plane.

33. (Original) The film bulk acoustic resonator device of claim 29 further including a conductive layer.

34. (Original) The film bulk acoustic resonator device of claim 33 wherein the seed layer

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is in a first plane, the layer of piezoelectric material is in a second plane, and at least a portion of the conductive layer is in a first plane.

35. (Original) The film bulk acoustic resonator device of claim 29 further comprising:
a first conductive layer; and
a second conductive layer, the first conductive layer deposited on a first surface of the piezoelectric material, and the second conductive layer deposited on a second surface of the layer of piezoelectric material.

36. (Original) The film bulk acoustic resonator device of claim 35 further comprising:
a first electrode; and
a second electrode, wherein the first conductive layer is a portion of the first electrode, and the second conductive layer is a portion of the second electrode.

37. (Original) The film bulk acoustic resonator device of claim 36 wherein at least one of the first electrode, and the second electrode has portions which are in different planes.

38. (Original) The film bulk acoustic resonator device of claim 36 wherein both the first electrode, and the second electrode have portions which are in different planes.

39. (Original) The film bulk acoustic resonator of claim 29 wherein the layer of piezoelectric material is a single-crystal film.

40. (Original) The film bulk acoustic resonator of claim 29 wherein the layer of piezoelectric material is AlN.

41. (Original) The film bulk acoustic resonator of claim 29 wherein the layer of piezoelectric material is ZnO.

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42. (Original) The film bulk acoustic resonator of claim 29 wherein the layer of piezoelectric material is a C-axis orientated film.

43. (Original) The film bulk acoustic resonator of claim 29 wherein the layer of piezoelectric material includes:

a C-axis oriented portion; and

a non C-axis oriented portion, wherein at least a portion of the first conductive layer and a portion of the second conductive layer is proximate the C-axis oriented portion of the layer of piezoelectric material.

44. (Original) The film bulk acoustic resonator of claim 29 wherein the seed layer is nonconductive.

Claims 45-49. (Canceled)

50. (New) The film bulk acoustic resonator device of claim 35 further comprising a source of RF voltage attached between the first conductive layer and the second conductive layer.

51. (New) The film bulk acoustic resonator device of claim 35 further comprising a source of RF voltage attached between the first electrode and the second electrode.